

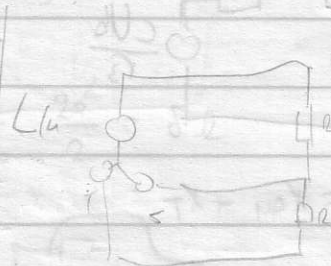
2AD 2A U

②  $U_n = 6,3 \text{ kV}$

$U_n = 6,3$

$U_s = 6,3 / \sqrt{3}$

$U_T = 6,3 / \sqrt{3}$



$I_1 = 377$

$U_f = \frac{6,3}{\sqrt{3}} = 3,63 \text{ kV}$

$I_1 = \frac{U_f}{Z} \quad Z = \frac{U_f}{I_1} = \frac{3,63 \text{ k}}{377} = 9,3 \Omega$

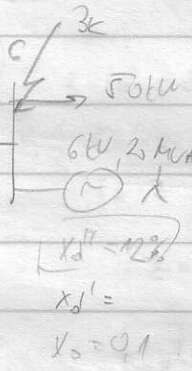
③



$S_{k3} = 500 \text{ MVA}$

$X_d = 8\%$

$D = 0 \text{ MVA}$

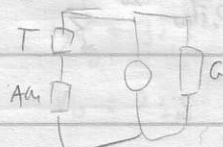
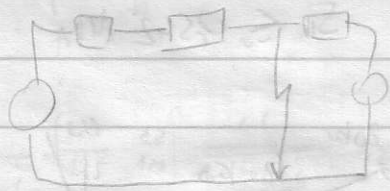


$U_b = 6 \text{ kV}$

④  $X_d = \frac{X_d}{100} \cdot \frac{U_b^2}{S_n} = 0,14 = X_i = X_d$

⑤  $X_g = \frac{X_d''}{100} \cdot \frac{U_b^2}{S_n} = 0,216$

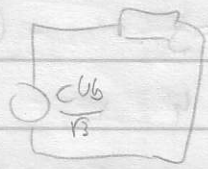
⑥  $X_d = \frac{11 U_b^2}{S_{k3}} = 0,099$



$Z_d = (T + AN) / 11 G$

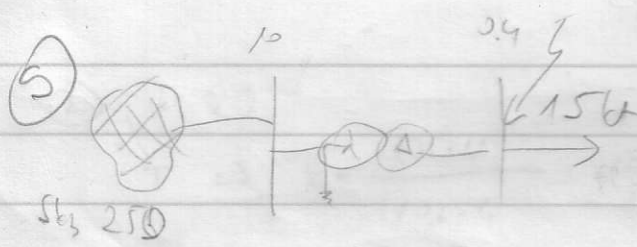
$= 0,215 + j 0,216$

$= 0,1058$



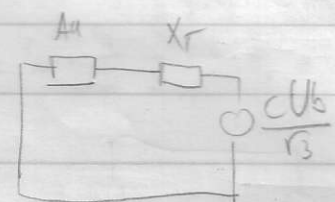
$I_{k3} = \frac{C \cdot U_b}{\sqrt{3} \cdot 0,1058} = 35,02 \text{ kA}$

$S = \sqrt{3} \cdot U \cdot I = 363 \text{ MVA}$



$$X_{A4} = \frac{C U_b^2}{S_{k3}} = 0.0007$$

$$X_T = \frac{55}{100} \cdot \frac{U_b^2}{S_n} = 0.0088$$



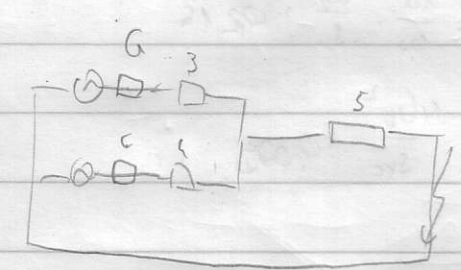
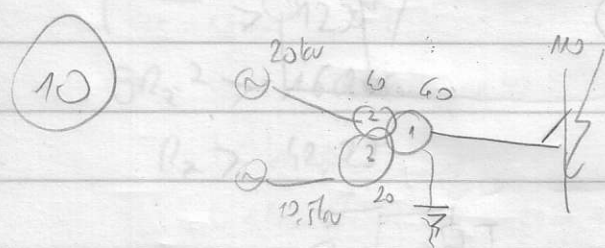
$$Z_1 = X_{A4} + X_T$$

$$\frac{C U_b}{\sqrt{3} Z} < 15$$

$$Z > \frac{C U_b}{15 \sqrt{3}}$$

$$\frac{0.0088 \cdot 0.6}{S_n} > \frac{C U_b}{15 \sqrt{3}} = 0.0007$$

$$S_n \leq 0.542 \text{ MVA}$$



$$X_{n1} = 8$$

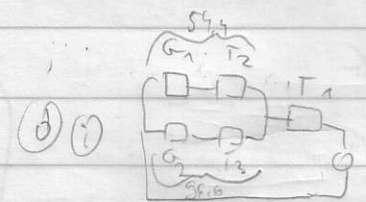
$$X_{n2} = 9$$

$$X_{n3} = 7$$

$$X_{d1} = \frac{1}{2} (X_{d11} + X_{d13} - X_{d23}) = 5$$

$$X_{d2} = \frac{1}{2} (X_{d23} + X_{d12} - X_{d13}) = 3$$

$$X_{d3} = \frac{1}{2} (X_{d23} + X_{d12} - X_{d12}) = 4$$

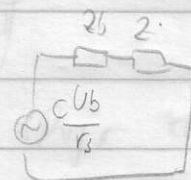


$$Z_{eq} = 4\sqrt{2}$$

$$X_{T1} = \frac{5}{100} \cdot \frac{110^2}{60} = 10.1$$

$$X_{T2} = \frac{3}{100} \cdot \frac{110^2}{40} = 5.07$$

$$X_{T3} = \frac{1}{100} \cdot \frac{110^2}{20} = 2.42$$

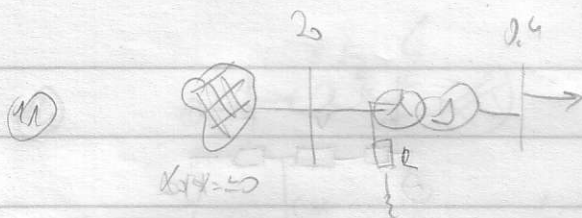


$$Z_{0k} = 2H = 50$$

$$I_{k2} = \frac{C U_b}{\sqrt{3} Z_{0k}} = \frac{C U_b}{Z_{0k}} = 1.3 \text{ kA}$$

$$X_{g1} = \frac{15}{100} \cdot \frac{110^2}{40} = 15.37$$

$$X_{g2} = 72.4$$



$$20/0.4$$

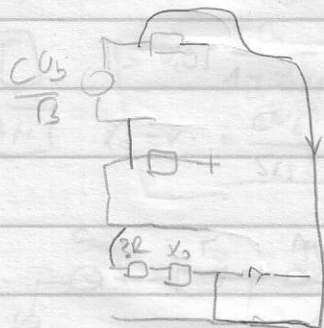
$$I_{L1} = 500$$

$$U_1 = 4\%$$

$$S_n = 2 \text{ MVA}$$

$$Y_{NoS}$$

$$I_T = \frac{U_1}{20} \cdot \frac{20^2}{2} = 5 \text{ A}$$



d) ①



$$Z_d = Z_i = 0.0032$$

$$3 \cdot 1.6 = 500$$

$$3 \cdot \frac{C \cdot U_b}{13 \cdot 2} = 1800$$

$$Z = \frac{r_2 C U_b}{0.8001} = 47.63$$

$$R = \sqrt{\frac{47.63^2 - 64}{9}} = 16 \Omega$$



$$X_d = X_i = \frac{C U_b^2}{50} = 332$$

$$X_0 = \frac{C U_b^2}{50} \cdot \left( \frac{2}{50} - \frac{2}{50} \right) = 16.96$$

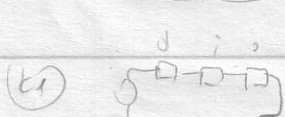
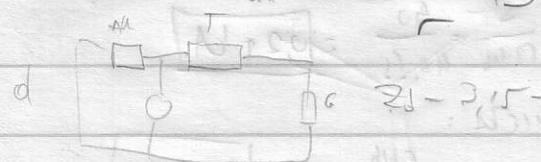
$$k = \frac{(U_n)^2}{C U_b^2} \cdot \frac{C_{max}}{1 + |k_d - r_d| S_{out}} \cdot \left( \frac{110}{125} \right)^2 \cdot \frac{1}{1 + |0.02/0.6|} = 0.585$$

$$X_T = 0.585 \cdot \frac{12}{10} \cdot \frac{10^4}{5} = 35.78$$

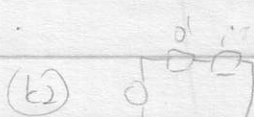
$$X_{d0} = 25.7$$

$$X_g = 32.7$$

$$V_0 = 23.8$$



$$I = \frac{13 C U_b}{242} = 19.56$$



$$I = \frac{C U_b}{13 \cdot 242} = 33.2$$



$$I_{k3} = \frac{C U_b}{13 \cdot 242} = 23.12$$

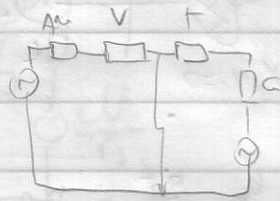
$$S_T = 13 \cdot U \cdot I > 403 \text{ MVA}$$



13)  $X_0 = \frac{C \cdot U_b^2}{S_{k3}} = 38$

$X_0 = C U_b^2 \left( \frac{3}{S_{k1}} - \frac{2}{S_{k2}} \right) = 25,66$

EL  $K = \left( \frac{U_n}{U_{ng}} \right)^2 \left( \frac{U_{LV}}{U_{LV}} \right)^2 \frac{C_{WKK}}{1 + (X_0^2 - X_1^2) \sin^2 \beta} = 0,980$



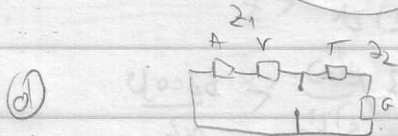
⊕  $X_0 = V_1 = V_2 = 0,98 \cdot \frac{10}{100} \cdot \frac{110^2}{40} = 29,64$

⊖  $X_{jd} = 0,98 \cdot \frac{13}{100} \cdot \frac{110^2}{40} = 38,53 = X_i$

$X_0 = 0,98 \cdot \frac{5}{100} \cdot \frac{110^2}{40} = 23,71$

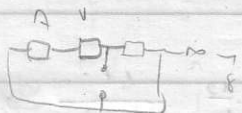
⊙  $Z_1 = 40(0,15 + j0,35) = 6 + j14$

$Z_2 = 12 + j28$



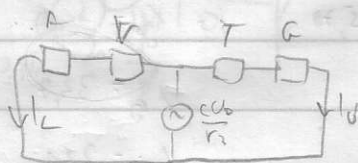
$Z_0 = Z_1 || Z_2 = (6 + j14) || (12 + j28) = 14,85 / 5,3$

⊙



$Z_0 = X_1 || (Z_0 + Z_{WKK}) = 29,64 || (12 + j53,66) = 15,36 / 5,5$

k3



Normal Power:

$I = \frac{S}{U_b} = \frac{40}{110 \cdot \sqrt{3}} = 0,21 \text{ kA}$

Thermites:

$I = I_{k3} \cdot \frac{U_{b0}}{U_b} = \frac{C U_b}{R \cdot Z_0} \cdot \sqrt{1,25} = 1,5 \text{ kA}$

UDANN

$I_0 \approx 10 \text{ kA}$

$I_L = \frac{C U_b}{R \cdot Z_L} = 3,72 / 1,3$

$I_0 = \frac{C U_b}{R \cdot Z_0} = 1,02 / 0,5$

$Z_L = 18,28 / 1,3$

$Z_0 = 18,28 / 0,5$

$R_L = 9,33$

$R = 4004$

$K = 1,02 + 0,5 \cdot \frac{R_L}{R} = 1,37$

$K = 1,55$

$I_{kL} = I_L \cdot K \cdot R = 7,23$

$I_{k0} = 2,58$

$I_0 = 10 \text{ kA}$

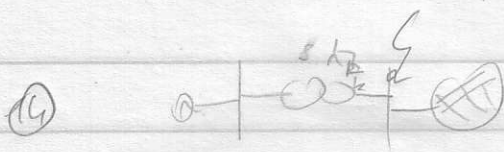
Bezie



$I = \frac{C U_b}{R \cdot Z_{k0}} = 4,70$

$I_{k1} = k \cdot R \cdot I = 5,74 \text{ kA}$

$\frac{R}{X} = 0,26 \Rightarrow K = 1,46$



G)  $k = \frac{C}{C_{eq} + 1 + k_d} = \frac{1.1}{1.25 + 1 + 0.96} = 0.977$   $X_d = 47.3$   $X_c = 56.1$

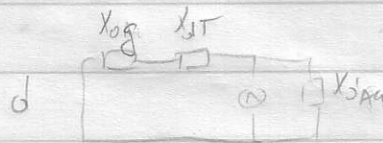
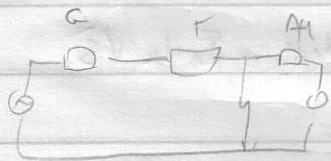
$I_i = 35.4$

T)  $k = 0.97 \frac{C}{1 + 0.96} = 0.977$

$X_d = 35.4$   $X_c = 56.1$

AM)  $X_d = X_c = \frac{C}{S_{L3}} = 5.32$

$I_o = C_{L2} \left( \frac{3}{S_{L2}} - \frac{2}{S_{L1}} \right) = 19.01$



$I_o = 19.01$

$Z_d = (5.32) \parallel (56.1 + j35.4) = 5.02$

$Z_i = (j35.4) \parallel (5.32 + j35.4) = 4.56$

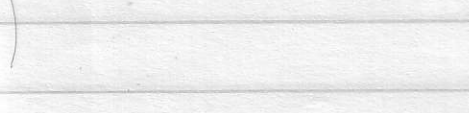
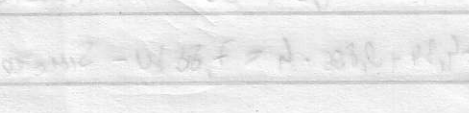
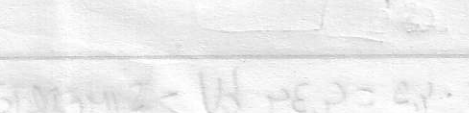


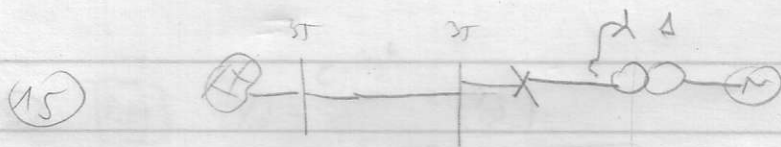
$I_{k2} = \frac{C}{Z_1 + Z_i} = 12.12$

$U_{L2} = 12.12 \cdot 5.32 = 64.4$

$U_{L1} = 12.12 \cdot 56.1 = 680.7$

$U_{L3} = 12.12 \cdot 5.32 = 64.4$





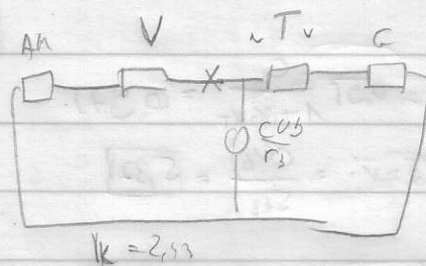
AM  $X_d = \frac{C U_b^2}{S L_b} = 1,12$

E  $k = \left( \frac{C_n U_{HV}}{C_{n0} U_{HV}} \right)^2 \frac{C}{1 + K_0^2 - K_T (S_{HV})} = 1,07$

G  $V_g = 12,22$

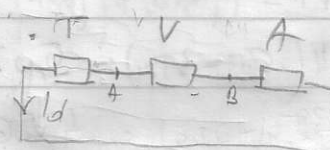
T  $V_T = 0,8, 10$

V  $C_u = 8$



$S \approx 150 \text{ MVA} = S_n \cdot k_c \cdot \sqrt{3}$

16  $k_3 = d$



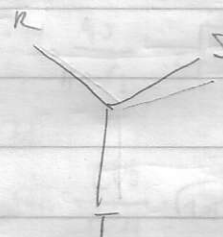
TRAF  $V_n = d \cdot \frac{10}{35} = 3,1 \cdot \frac{10}{35} = 0,8857$  - sve je simetrično ( $k_3$ )

WD = TRAF  $V_n$

$I_R = I_d \cdot e^{j \frac{\pi}{6}} = 0,886 \angle 150$

$I_S = a^2 I_d \cdot e^{j \frac{\pi}{6}} = 0,886 \angle 30$

$I_T = a I_d \cdot e^{j \frac{\pi}{6}} = 0,886 \angle 270$



$X_{TA} = \frac{8}{100} \frac{35^2}{25} = 4,9 \Omega$

$V_{RA} = I_R \cdot X_{TA} = 0,886 \cdot 4,9 = 4,34 \text{ kV}$  - SIMETRIČNO

$V_{RB} = V_{RA} + I_R \cdot X_V = 4,34 + 0,886 \cdot 4 = 7,88 \text{ kV}$  - SIMETRIČNO